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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/767,764	01/29/2004	Max F. Hineman	2269-5925US (03-0290.00/U)	5543
24247	7590	12/01/2006	EXAMINER QUINTO, KEVIN V	
TRASK BRITT P.O. BOX 2550 SALT LAKE CITY, UT 84110			ART UNIT 2826	PAPER NUMBER

DATE MAILED: 12/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/767,764

Applicant(s)

HINEMAN ET AL.

Examiner

Kevin Quinto

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11 September 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-25 is/are allowed.
- 6) ☒ Claim(s) 26-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments filed September 11, 2006 have been fully considered but they are not persuasive. The applicant's arguments with regard to claims 26-33 appear to be based upon the reasoning that Taguchi et al. (USPN 6,645,852 B1) fails to state the exact claim limitation, "partly reversed oxidation injury." The applicant's currently filed specification (p. 6, paragraph 16) appears to define a partly reversed oxidation injury as a process in which "... the hydrogen plasma step heals (e.g., reduces copper oxide to copper) the damage to the copper caused by prior processing, less copper is removed by subsequent wet cleaning, and voids are less likely to form in the copper." The reduction of copper oxide to copper is the same process which Taguchi uses in order to fabricate the damascene structure (column 4, lines 63-65, column 6, lines 44-47); thus Taguchi anticipates the limitation regarding "a partly reversed oxidation injury." Therefore the rejection made in the previous Office action stands.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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3. Claim 26, 27, 31, and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Taguchi et al. (USPN 6,645,852 B1).

4. In reference to claims 26 and 31, Taguchi et al. (USPN 6,645,852 B1, hereinafter referred to as the "Taguchi" reference) discloses a structure which meets these claims. Figure 1B of Taguchi illustrates a metallic damascene structure which meets claims 26 and 31. Figure 1B of Taguchi illustrates a metallic damascene structure with a substrate (11) and a metallic layer (15) extending over at least a portion of a surface of the substrate (11). The metallic layer (15) includes an at least partially reversed oxidation injury (column 5, lines 15-67 and column 6, lines 1-36). An insulating layer (17) extends over at least a portion of the metallic layer (15). A damascene opening (17) extends over at least a portion of the metallic layer (15). A damascene opening extends through at least a portion of the insulating layer (17) and exposes at least a portion of the metallic layer (15). The at least a portion of the metallic layer (15) exposed through the damascene opening comprises the at least partially reversed oxidation injury (column 5, lines 15-67 and column 6, lines 1-36) of the metallic layer (15). There is a metallic plug (26) in the damascene opening and it is in electrical connection with the metallic layer (15).

5. With regard to claims 27 and 32, Taguchi discloses that the metallic damascene structure of figure 1B is to be used in an electronic device (abstract).

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over of Taguchi et al. (USPN 6,645,852 B1) in view of Kitani (USPN 6,424,042 B1) and further in view of Oashi et al. (United States Patent Application Publication No. US 2002/0030215 A1).

8. With regard to claim 28, Taguchi does not disclose the use of the damascene structure in a memory device. However the use of damascene structures in memory devices is well known in the art. Kitani (USPN 6,424,042 B1) discloses that using damascene structures in memory devices has the benefit of providing an increased operation speed (column 1, lines 14-19). Oashi et al. (United States Patent Application Publication No. US 2002/0030215 A1, hereinafter referred to as the "Oashi" reference) discloses that a faster operation speed is a known goal in the art (p.1, paragraph 5). In view of Kitani and Oashi, it would therefore be obvious to implement the damascene structure of Taguchi in a memory device.

9. Claims 29, 30, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (USPN 6,885,080 B2) in view of Oashi et al. (United States Patent Application Publication No. US 2002/0030215 A1) and further in view of Taguchi et al. (USPN 6,645,852 B1).

10. In reference to claims 29, 30, and 33, Chen et al. (USPN 6,885,080 B2, hereinafter referred to as the "Chen" reference) discloses an electronic device with a microprocessor and an embedded dynamic random access memory (DRAM) or

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integrated circuit coupled to it on the same substrate (column 1, lines 12-16). Chen does not disclose the use of damascene structures for DRAM. However the use of damascene structures in a DRAM is well known in the art. Oashi (United States Patent Application Publication No. US 2002/0030215 A1, hereinafter referred to as the "Oashi" reference) discloses a DRAM with damascene structures in figure 22. Oashi discloses that such a DRAM has a small size (p.1, paragraph 22) which is desirable in the art (p.2, paragraph 7). In view of Oashi, it would therefore be obvious to implement a DRAM with damascene structures in the electronic device of Chen. Neither Oashi nor Chen discloses the use of a metallic damascene structure with a partially reversed oxidation injury in a metallic layer. However the use of such a structure is known in the art. Taguchi et al. (USPN 6,645,852 B1) discloses a metallic damascene structure. Figure 1B of Taguchi illustrates a metallic damascene structure with a substrate (11) and a metallic layer (15) extending over at least a portion of a surface of the substrate (11). The metallic layer (15) includes an at least partially reversed oxidation injury (column 5, lines 15-67 and column 6, lines 1-36). An insulating layer (17) extends over at least a portion of the metallic layer (15). A damascene opening extends through at least a portion of the insulating layer (17) and exposes at least a portion of the metallic layer (15). The at least a portion of the metallic layer (15) exposed through the damascene opening comprises the at least partially reversed oxidation injury (column 5, lines 15-67 and column 6, lines 1-36) of the metallic layer (15). There is a metallic plug (26) in the damascene opening and it is in electrical connection with the metallic layer (15). Taguchi discloses that this damascene structure has the advantage of providing a

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contact structure with low resistance and high reliability (column 7, lines 6-16). The removal of copper oxide in a contact structure in order to attain low resistance and high reliability are known goals in the art (column 1, lines 42-48, column 7, lines 6-16). In view of Taguchi, it would therefore be obvious to implement such a damascene structure in the electronic device of Chen constructed in view of Oashi in order to attain the benefit of a low resistance damascene structure.

***Allowable Subject Matter***

11. Claims 1-25 were allowed in a previous Office action.

***Conclusion***

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Quinto whose telephone number is (571) 272-1920. The examiner can normally be reached on M-F 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KVQ

  
**EVAN PERT**  
**PRIMARY EXAMINER**